Appl. No. 10/586,177
Response to Office Action of January 23, 2009

PATENT
Docket No.: DE040018US1
Customer No. 000024737

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (currently amended) A device for navigating an instrument (4) in a body volume that is subject to a spontaneous movement that can be described by a movement parameter (E), comprising:

a)   a locating device (2) for ~~determining the~~ measuring a location (r) of the instrument (4);

b)   a sensor device (5) for ~~determining~~ measuring the movement parameter (E); and

c)   a data processing device (10) coupled to the locating device (2) and the sensor device, wherein the data processing device comprises (5) and comprising a movement model (11) that describes the spontaneous movement of the body volume as a function of the movement parameter (E), wherein with (i) the aid of the movement model, (ii) a current measured location (r) and (iii) an associated current movement parameter, the data processing device (10) is designed to correlate calculates an estimated movement-compensated location ($r + \Delta$), corresponding to the current measured location (r) plus a vectorial displacement (Δ), of the instrument that the instrument would have in a reference phase (E_0) of the spontaneous movement ~~with measured values of the~~ ~~location (r) of the instrument (4) and of the associated movement parameter (E) with the~~ ~~aid of the movement model (11)~~.

2. (currently amended) [[A]] The device as claimed in claim 1, ~~characterized in that~~ wherein the data processing device (10) is designed to reconstruct the movement model (11) from measured values for the location of ~~the~~ interpolation nodes and ~~for the~~ associated movement parameters (E).

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3. (currently amended) [[A]] The device as claimed in claim 2, ~~characterized in that~~ further wherein the data processing device (~~10~~) is designed to supplement the measured movement of the interpolation nodes in the movement model (~~11~~) by interpolation.

4. (currently amended) [[A]] The device as claimed in claim 2, ~~characterized in that~~ further wherein the data processing device is designed to determine~~, in particular from X-ray, CT or MRI recordings,~~ measured values for the location of interpolation nodes from a series of three-dimensional images of the body volume, wherein the series of three-dimensional images are obtained from at least one of X-ray, CT and MRI recordings.

5. (currently amended) [[A]] The device as claimed in claim 2, ~~characterized in that~~ wherein the measured values for the location of the interpolation nodes of the body volume correspond to locations (r), measured with the locating device (~~2~~), of the instrument (~~4~~).

6. (currently amended) [[A]] The device as claimed in claim 5, ~~characterized in that~~ wherein the measured locations (r) of the instrument (~~4~~) ~~have been~~ are obtained without moving the instrument (~~4~~) relative to the body volume.

7. (currently amended) [[A]] The device as claimed in claim 1, ~~characterized in that~~ further wherein the data processing device (~~10~~) comprises a memory containing a static image (~~12~~) of the body volume and is designed to determine the estimated movement-compensated location (r + Δ), ~~estimated~~ for the reference phase (E$_0$), of the instrument (~~4~~) in the static image.

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8. (currently amended) [[A]] The device as claimed in claim 1, ~~characterized in that~~ wherein the sensor device comprises an ECG apparatus ~~(5)~~ and/or an apparatus for determining the respiration phase.

9. (currently amended) [[A]] The device as claimed in claim 1, ~~characterized in that~~ wherein the locating device ~~(2)~~ is designed to determine the location of the instrument ~~(4)~~ with the aid of magnetic fields and/or with the aid of optical methods.

10. (currently amended) A method of navigating an instrument ~~(4)~~ in a body volume that is subject to a spontaneous movement that can be described by a movement parameter (E), the method comprising ~~the following steps~~:

a) ~~measurement of the~~ measuring a location of interpolation nodes of the body volume and ~~of the~~ associated movement parameters (E) in different phases of the spontaneous movement;

b) ~~reconstruction of~~ reconstructing a movement model ~~(11)~~ for the body volume from said measured values of the location of interpolation nodes and associated movement parameters;

c) ~~measurement of the~~ measuring a location (r) of the instrument ~~(4)~~ and ~~of the~~ an associated movement parameter (E); and

d) ~~calculation of the~~ calculating, with the aid of the movement model, a current measured location and an associated current movement parameter, an estimated movement-compensated position ($r + \Delta$), corresponding to the current measured location (r) plus a vectorial displacement (Δ), of the instrument ~~(4)~~ in a reference phase (E_0) of the spontaneous movement ~~with the aid of the movement model (11)~~.